BANDWIDTH ENHANCEMENT TECHNIQUES FOR NJICI<OS'J'R11' REFLECTARRAY

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'] 'he microstrip reflectarray antenna, being a flat reflector, is finding increasing applications in satellite communications and commercial usages. For examples, high-gain antennas with small volume and low mass are needed in microspacecraft development, and wall-mounted flat antennas are demanded for Direct Broadcast Satellite (DBS) application. The printed reflectarray has several advantages when compared to the conventional parabolic reflector. First is its capability to comformally mount its reflecting surface onto existing structure to save mass and real estate. Secondly, its main beam can be designed to tilt to a large angle (>50°) from its broadside direction. Thirdly, being flat, its manufacturing cost for large quantities can be lower, and it can be easily foldable for packaging and transportation. Finally, it can be easily made to generate multiple polarizations for radar applications. However, the reflectarray dots have one significant disadvantage which is its narrow bandwidth. Without any improvement technique, the bandwidth of the microstrip reflectarray is limited to be less than 3%. This narrow bandwidth is caused primarily by two factors. One is the inherent narrow band characteristic of the microstrip patch elements and the other is the differential spatial phase delay **which** causes frequency dispersion error. To minimize these narrow band effects, three techniques arc described here to incr-case the bandwidth of the microstrip reflectarray to perhaps more than 10%. These techniques arc : (1) to design the reflectarray with large f/D ratio, (2) to use sequentially rotated 4-element subarrays for circular polarization and to use oppositely exicited 2-element subarray for linear polarization, and (3) to employ time delay lines instead of phase delay lines for all the elements. These bandwidth enhancement techniques will be presented in more detail in the symposium.

The research described in this paper was carried out by the Jet Propulsion laboratory, California institute of Technology, under contract with the National Aeronautics and Space Administration.